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SPOLIA ZEYLANICA.

CONSTITUTION OF THE FAUNA OF CEYLON.

By A. Willey.

AMONG the introductory paragraphs of Sir J. Emerson Tennent's "Sketches of the Natural History of Ceylon" (1861), the following quotation reproduced from his classical "Account of the Island" (1859) contains a succinct statement of the principal literature written in the English language in which the Fauna of Ceylon had been dealt with in a more or less comprehensive or special manner before his time.

I will repeat in full the paragraph to which I am referring, because Sir Emerson Tennent's words will perhaps form a fitting prelude to the quarterly record of observations and experiences, of which this is the first number to issue from the Ceylon Government Press :—

> Regarding the Fauna of Ceylon, little has been published in any collective form, with the exception of a volume by Dr. Kelaart, entitled *Prodromus Faunæ Zeylanicæ* [1852] : several valuable papers by Mr. Edgar L. Layard in the Annals and Magazine of Natural History for 1852 and 1853 ; and some very imperfect lists appended to Pridham's Compiled Account of the Island [1849]. Knox, in the charming narrative of his captivity, published in the reign of Charles II. [1681], has devoted a chapter to the animals of Ceylon, and Dr. Davy [1821] has described some of the reptiles : but with these exceptions the subject is almost untouched in works relating to the Colony.* Yet a more than ordinary interest attaches to the inquiry, since Ceylon, instead of presenting, as is generally assumed, an identity between its fauna and that of Southern India, exhibits a remarkable diversity, taken in connection with the limited area over which the animals included in it are distributed. The Island, in fact, may be regarded as the centre of a geographical circle, possessing within itself forms whose allied species radiate far into the temperate regions of the north as well as into Africa, Australia, and the Isles of the Eastern Archipelago.

In the light of our present knowledge of zoogeography it is, no doubt, an exaggeration to claim Ceylon as an important centre of

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* Of course this reproach no longer holds good since the issue, under the editorship of Dr. W. T. Blanford, F.R.S., of many volumes of "The Fauna of British India, including Ceylon and Burma," a monumental work which was commenced in 1888 under the authority of the Secretary of State for India in Council, and is still in course of publication, new volumes being added to the series periodically.

geographical distribution, since this would imply the existence in the insular fauna of more primitive components than is actually the case. Indeed, in its present position and configuration Ceylon can hardly be regarded, in any instance, as the feeder of the Indian Peninsula nor of any other zoological province.

Of the thirty-nine genera of indigenous Mammalia not one is peculiar to the Island ; there is not even one peculiar Mammalian species, although there may be some insular races of continental species. The tailless lemur, locally known as the Ceylon Sloth (*Loris gracilis*),* rarely seen on account of its nocturnal and arboreal habits, though living in the outskirts of Colombo, is confined to Ceylon and to the Carnatic Tract† of Southern India, this being the most restricted range of any Indo-Ceylonese Mammal.

All the other species of Mammals known to occur in Ceylon have a much more extended range, though some few are restricted to Ceylon and the Indian Peninsula, among the more notable examples of this kind being the Ceylon bear, which is co-specific with the Indian Sloth Bear (*Melursus ursinus*), the Scaly ant-eater or Indian pangolin (*Manis pentadactyla*),‡ and the mouse-deer or Indian chevrotain (*Tragulus meminna*).§

On the other hand, no fewer than fifteen genera of Mammals occur in the Indian Peninsula, which are not represented in Ceylon, the most prominent of these being four antelopes, namely, the Nilgai (*Boselaphus tragocamelus*), the four-horned antelope (*Tetraceros quadricornis*), the black buck (*Antilope cervicapra*), and the Indian gazelle (*Gazella bennetti*). The absence of antelopes from Ceylon may be looked upon as ranking among the "famous deficiencies" of the Island, analogous, for example, to the absence of snakes from Ireland, Iceland, and New Zealand. Other creatures whose presence in neighbouring countries renders their absence from Ceylon the more conspicuous are, for example, tigers, vultures, cranes, and hamadryads.||

The range of the hamadryad is approximately co-extensive with that of the cobra di capello (*Naia tripudians*) upon which, to a certain extent, it feeds. [See article by Vety. Capt. G. H. Evans on "The King Cobra or Hamadryad" in J. Bombay Soc.,

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* Unahapuḷuwá of the Siṃhalese.

† Blanford, W. T. The distribution of vertebrate animals in India, Ceylon, and Burma. *Phil. Trans.* (Series B), vol. 194, pp. 335–436, 1901.

‡ Kaballẹwá, S.

§ Míminná, S.; sometimes called Wali-miya, S.

|| The Hamadryad or king cobra is named *Naia bungarus* on grounds of priority [see Boulenger, G. A. Fauna Brit. Ind. Reptilia and Batrachia, p. 392, 1890]. It is also widely known as *Ophiophagus elaps*, its food consisting principally of other snakes.

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Fig. 1.—GAUTAMA BUDDHA AND THE SERPENT MUCALINDA.

From a wooden effigy in the Colombo Museum.   Height of original, 1 foot 2 inches.

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vol. XIV., pp. 409–418, 1902 ; also in the same Journal on p. 629, a note on the "Food of the King Cobra," by E. H. Aitken]. But whereas the cobra occurs in Ceylon, where the manifold symbolic uses to which it has been put have rendered it sacred and classical, the more dreaded hamadryad is not found here.

The shelter attributed to the Lord of Lanka beneath the mantling hood of the sacred Nága, cobra di capello, is a picturesque example of the ancient interpretation of divine influence in the East. The effigies which commemorate this miracle are executed in brass and wood (see Fig. 1), and are described as the "Serpent-canopied Buddha" [*cf.* Sir M. Monier-Williams, "Buddhism," London, 1889, p. 480, and frontispiece].

The examples of distribution selected from the Mammalian section of the fauna seem to indicate that Ceylon is an outlier of India rather than itself a centre of distribution, and that it bears the same relation to India that Tasmania does to the island continent of Australia or the British Isies to the continent of Europe. From this point of view the Fauna of Ceylon may be regarded as a Relict Fauna, the members of which have been separated from their continental allies by subsidence of land and encroachment of sea since the Tertiary Epoch.

Excluding the category of Oceanic Islands, it is a generally accepted axiom that the terrestrial fauna of any island has reached its destination by means of former land connections between the island and neighbouring continental areas. Thus it is calculated that at least ninety-five per cent. of the British species of animals have reached the British Isles by previous land-connections with Scandinavia and the Arctic Continent in the north and with France and Belgium to the south-east.*

Before proceeding further with our analytical sketch of the Fauna of Ceylon, it will be interesting to consider more closely (with the assistance of Dr. Blanford's Memoir to which I have referred above) the relation of Ceylon to the Indian Peninsula.

The Indian region is divided into two main sub-regions by the Indo-Gangetic Plain, which extends from the Arabian Sea to the Bay of Bengal and "forms a geological boundary of the highest importance."

The Transgangetic sub-region includes the Himalayas, Assam, Burma, &c. The Cisgangetic sub-region includes the Indian Peninsula proper and Ceylon.

The Indian Peninsula is again divided into two very unequal parts by the Western Ghats or Sahyádri mountains which separate

* Scharff. R. F. The History of the European Fauna. London, 1899. (Contemp. Sci. Ser.)

the Malabar Coast Tract from the Central Provinces and the Carnatic.

The investigation of the fauna of Ceylon may be approached from at least three standpoints (excluding, for the moment, the economic side of the question), namely, zoogeographical, faunistic, and local or insular. Moreover, from whatever point of view the subject be regarded, the fauna of Ceylon presents a dual character.

From its purely faunistic aspect the dual character of the fauna depends upon the fact that, in addition to the relict or continental types, to some of which allusion has already been made, Ceylon possesses an extensive series of endemic or peculiar types.

Considered zoogeographically, it has been shown by Captain Legge* and by Dr. Blanford that the Ceylon area comprises two tracts, namely, the Northern Ceylon Tract, including the Northern and Eastern Provinces, with an average rainfall of about 50 inches; and, secondly, the Hill Ceylon Tract, comprising the Central, Western, and Southern Provinces, with an average rainfall exceeding 100 inches. The Northern Tract is defined by Dr. Blanford as being "in fact a part of the Carnatic with higher rainfall and with much more forest," while the Hill Tract "must be regarded as a part of the Malabar Tract."

From the local or insular standpoint, the faunal elements are grouped under the two headings of low-country and up-country types. As might be expected, there is a great amount of overlapping in the local distribution of particular species, and the special characteristics of the fauna of the various Provinces of the Island have yet to be ascertained with such precision, for example, as that with which the birds of Sabaragamuwa have been dealt with by Mr. F. Lewis.† It may be hoped that, in course of time, we shall obtain further information on this matter of local distribution by means of a system of careful records of the occurrence of species in different localities and at different times and seasons.

Of the 360 species of birds which have been recorded from Ceylon, as many as forty-nine, or nearly one-seventh, are peculiar to the island. The number of genera in which the species are grouped is 240, of which, as noted by Dr. Blanford, eighty-two, or rather more than one-third, belong to one order, namely, the Passeres. Only six genera of birds are peculiar to the island, and five of these are passerine.

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* Legge, W. V. A History of the Birds of Ceylon (*vide* Introduction, p. xiii. London, 1880.)

† Lewis, F. Field-notes on the Land Birds of the Province of Sabaragamuwa, *Ibis*, 1898, Part I., pp. 334–356; Part II., pp. 524–551

FIGS. 2 AND 3.—OPHIOCEPHALUS STRIATUS (FROM ABOVE AND FROM BELOW).
Photographed from a specimen in the Colombo Museum.

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Certain genera and species of birds, reptiles, and batrachians are restricted to Ceylon and the Malabar Tract. Again, the distribution of some animals points to the existence of a decided Himalayan affinity in the fauna of Ceylon, in so far that certain genera, which are represented by isolated species in Ceylon, only occur otherwise in Transgangetic countries, in some cases also in Malabar.

Thus, the chestnut and blue magpie of Ceylon (*Cissa ornata**) and the yellow-fronted barbet (*Cyanops flavifrons* †), inhabitants of the upland forests, are peculiar to the island, while their congeners are Transgangetic and Himalayan species (Oates and Blanford).

The remarkable legless Batrachian, *Ichthyophis glutinosus*, which is frequently dug out of its burrows in the plantations of Ceylon, and may be described as an eel-like, scale-bearing salamander, nearly black in colour with a bright yellow band running along each side of the body, occurs in the "Mountains of Ceylon, Malabar, Eastern Himalayas, Khasi Hills, Burma, Siam, Malay Peninsula, Sumatra, Borneo, Java" (Boulenger, Fauna Brit. Ind. Reptilia and Batrachia, p. 516).

The large tank fish "lula" (plural "lullu") of Ceylon (*Ophiocephalus striatus* ‡), which belongs to a distinctively Oriental family, the Ophiocephalidæ, occurs "throughout the plains of India, Ceylon, and Burma to China and the Philippines" (Day, Fishes of India, p. 366); but a nearly related fish (*Channa orientalis* §) of the same family, said to be common in the low-country paddy fields (Haly, M. S.), affords an excellent example of discontinuous distribution, occurring only in the fresh waters of Ceylon and China, being absent from the intervening countries (Day and Blanford).

Besides the Himalayan or Transgangetic element in the fauna of Ceylon, there are other foreign representatives which deserve special mention, namely, the Malay, Mascarene (Madagascar and neighbouring islands), and Australian elements.

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* This bird is called the Ceylonese Jay by Legge [Birds of Ceylon, p. 353], and the Ceylonese Magpie by Oates [Oates, E. W. Fauna Brit. Ind. Birds, vol. I., p. 29, 1889], the explanation being that the genus *Cissa* is as nearly related to *Pica*, the Magpie, as it is to *Garrulus*, the Jay, neither of which cross the Ganges. The Ceylonese Jay or Magpie is not to be confounded with the common black and white Magpie-robin (*Copsychus saularis*) of Colombo and the low-country, the "Polli-cha" of the Sinhalese. The Magpie-robin also occurs in the Kandy District and elsewhere.

† Described under the synonym of *Megalæma flavifrons* by Legge [Birds of Ceylon, p. 212].

‡ Known as the "Murrel" to Indian anglers (see Thomas, H. S. The Rod in India. Mangalore, 1873).

§ Kánaya, S. Common at Kesbewa and in the Wellawatte canal.

Many of the characteristic forms of the Malay Peninsula and the Sunda Islands are conspicuous by their absence from Ceylon, *e.g.*, the flying lemur (*Galeopithecus volans*) among Mammals, the flying lizard (*Draco maculatus*) among reptiles, the robber crab* (*Birgus latro*) among Crustacea, and the singular Proto-tracheate genus *Peripatus*. It is therefore remarkable to learn that it is none the less possible to recognize a special Malay affinity in the fauna of Ceylon, exemplified by certain rare denizens of the dense forests and luxuriant gorges of the interior. Captain Legge has drawn attention to this point in the case of two birds, namely, Bligh's whistling thrush (*Arrenga blighi* †) and the red-faced malkoha or ground cuckoo (*Phœnicophaës pyrrhocephalus*), both peculiar to Ceylon, but presenting near affinities to species from Java, Sumatra, and the Malay Peninsula.

Even the elephant, "the lord paramount of the Ceylon forests," has to be considered in this connection. Sir E. Tennent, who was one of the first to recognize a Malayan affinity in the fauna and flora of Ceylon, records the fact, established independently by the Dutch anatomists Temminck and Schlegel, that the Ceylon elephant is identical with the Sumatran elephant, which Temminck named *Elephas sumatranus*, and "differs as much from the elephant of India as "the latter from its African congener."‡ The specific distinction of the Sumatran from the Indian elephant is not commonly upheld now. The former is probably no more than an insular race of the Asiatic species, *E. indicus*.

Several reptilian genera which are represented in Ceylon and the Eastern Archipelago are wanting in the Indian Peninsula. An interesting example of this kind is furnished by a small burrowing snake, *Cylindrophis maculatus*, one of those to which the term "depatnaya" is applied. It is common in Colombo, Balangoda, and elsewhere, and may be easily recognized by its glistening skin adorned with a network of dense black markings. The broad meshes of the network are occupied by brown pigment above and brilliant white below. A small tract on the upper lip below the eye on each side of the head, a pair of oblique tracts behind the eyes and the areas immediately behind the large triangular black patch on the head, separated from one another by a narrow median black stripe, are also dense white in colour.

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* The robber crab is found locally all over the Eastern Archipelago from Christmas Island to the Loyalty Islands, but west of the Straits it only occurs on the South Sentinel, an islet of the Andaman Group less than one square mile in extent, and in the Nicobar Islands (see Alcock, A. A. Naturalist in Indian Seas, 1902, pp. 83 and 151).

† Syn. *Myiophoneus blighi* [Legge. Birds of Ceylon, p. 463].

‡ Tennent, *op. cit.*, pp. 64–68.

These points are not very well shown in Fig. 4. This earth-snake attains a length of about one foot with an even diameter of some five-sixteenths of an inch. As a species it is peculiar to Ceylon, but the genus is represented in the Malay Peninsula and Archipelago by a closely related species, *Cylindrophis rufus*.

Fig. 4. *Cylindrophis maculatus*.
From a specimen in the Colombo Museum, found in Colombo. About half natural size.

Perhaps even more remarkable than the evidence of Himalayan and Malay components of the Ceylon fauna is that which relates to the Mascarene element. Madagascar is well known as the headquarters of lemurs and of chameleons,* harbouring more species of these animals than occur in any other quarter of the Old World. Ceylon possesses a single species of lemur, the *Loris gracilis* referred to above, and a single species of chameleon (*Chamæleo calcaratus*). True chameleons are characterized by the great length of the tongue, by the mobility of the eyes (ensheathed within a circular eyelid which accompanies the eyeball in its rolling movements, each eyeball moving independently), and by the structure of the feet, which are specially adapted for climbing along the branches of the trees, having the toes closely webbed together into two groups. In the forefeet the two outer and the three inner toes are respectively united together, forming two divergent, opposable groups, while in the hind feet it is the three outer and the two inner toes which are thus united.

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* During the last century, precisely between the years 1800 and 1900, eighty-two species of chameleons have been described. Of these, Madagascar possesses thirty-three species, thirty of which are peculiar. This is the highest percentage (91 per cent.) of endemicity in any zoological province in which chameleons occur. They are confined to the Old World, and the Indo-Ceylonese species marks the Eastern limit of the family (see Werner, F. Prodromus einer Monographie der Chamäleonten. Zool. Jahrb. Syst., XV., 1902, p. 332).

All chameleons possess the faculty of changing colour, but all lizards which change colour are not chameleons, those which are commonly seen along the roadside in Ceylon belonging to a genus of Oriental lizards named *Calotes* by Cuvier. The true chameleon seems to be rare in Ceylon, and I have not seen one in the jungle hitherto, though the Colombo Museum possesses four specimens from four different localities, namely, Mullaittivu (W. Ferguson), Chilaw (H. Nevill), Puttalam (F. A. Fairlie), and finally, one which is said to hail from Colombo (A. Haly, Report on Reptilia in Col. Mus., 1891).

The distribution of a genus of skinks (the family of lizards to which the Brahminy lizard, *Mabuia carinata*, belongs) named *Acontias*, also points to a marked Ethiopian (Mascarene and African) affinity in Ceylon. Four species of *Acontias* are endemic in Ceylon, "none in any other part of the Indo-Malay region, two or three have been brought from Madagascar, four from South Africa" (Blanford, *op. cit.*, 1901, p. 395).*

Among the birds, the Drongos or king crows (*Dicruridæ*) point in the same direction, the black drongo (*Dicrurus ater*), which may be met with in the wayside jungle between Chilaw and Puttalam, being regarded by Oates as synonymous with the *Edolius forficatus* of Madagascar, of which the term "Drongo" is the original native name.†

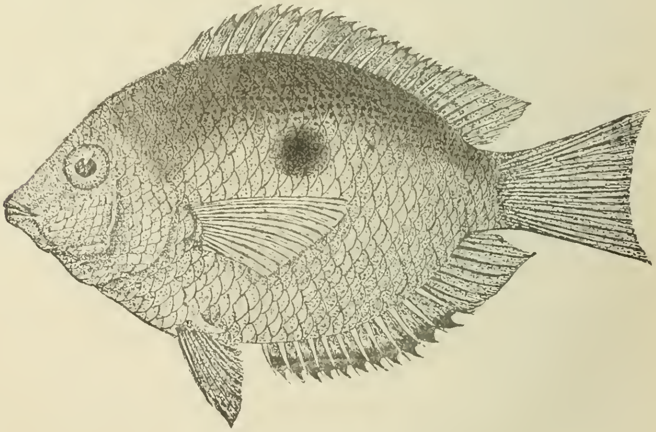

Fig. 5. *Etroplus maculatus.*
From the Colombo Lake.

A small fresh water fish which occurs in the Colombo lake, called "Rallia" in Sinhalese (*Etroplus maculatus*), belongs to a

* Dr. Alcock (A Naturalist in Indian Seas, 1902, see p. 140) mentions a small though gorgeously coloured Tree-gecko, *Phelsuma andamanense*, which is peculiar to the Andamanese jungles, while its congeners are confined to Madagascar and the neighbouring islands, the Comoros, Mauritius, and the Seychelles.

† Newton, A. A. Dictionary of Birds. London, 1893–1896.

strictly Indo-Ceylonese genus (*i.e.*, confined to Ceylon and the Indian Peninsula), whose nearest relative is the genus *Paretroplus* of Madagascar (Day, F., Fishes of India, 1878, p. 414).

The Land Mollusca of Ceylon are highly peculiar, and the largest of them are the species of the genus *Acavus*, which is confined to Ceylon, but exhibits close relationship with the genus *Helicophanta* of Madagascar.*

The earthworms† of Ceylon include no fewer than thirty endemic species, of which seventeen belong to the genus *Megascolex*, whose headquarters are in Australia, while eight other species of the same family (*Megascolecidæ*) belong to genera which, until recent years, had only been met with on the Australian Continent, namely, the two genera *Cryptodrilus* and *Megascolides*. One Ceylon species of *Megascolex* (*M. armatus*) occurs also in Madagascar, Zanzibar, and several other localities, though there is some doubt as to how far this species may have been accidentally conveyed from place to place by shipping.

The second family of Ceylon earthworms (*Moniligastridæ*) is represented by four species of *Moniligaster*, which is a dominant East Indian or Malayan genus.

The Ceylon earthworms therefore afford an indication of the existence of an Australian element in the fauna, which might be further illustrated by examples taken from other groups of terrestrial invertebrates. Thus, the snail *Acavus* appears, from the large size of the egg and of the embryonic shell which forms within it, to be as nearly related to the Australian genus *Panda* as to the Mascarene genus *Helicophanta* (Cooke, *op. cit.*).

The application of these facts to the theory of geographical distribution can only be indicated here in the briefest manner. The Island of Celebes is to the Oriental region what New Zealand is to the Australian region. The Fauna of Celebes is one of the most peculiar insular faunas in the world. Professor Semon has voiced a widely held opinion that Celebes has received the most characteristic members of its fauna, such forms as the monkey (*Cynopithecus*), the deer (*Anoa*), the pig (*Babirussa*), the lemur (*Tarsius*), &c., from the west, either from Asia or from a huge continent or archipelago which spread far to the West, of which Madagascar is perhaps the last remnant.‡ Of course Ceylon must also have formed part of this continent, the Lanka of the ancients,

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* Cooke, A. H. Molluscs. Cambridge Nat. Hist., 1895, see pp. 303 and 355. The genus *Acavus* comprises the common Ceylon snails which are seen adhering to the trunks of trees and to fences in most parts of the Island.

† Michaelsen, W. Die Terricolenfauna Ceylons. Mt. Mus., Hamburg, XIV., 1897, 94 pp., 1 plate.

‡ Semon, R. In the Australian Bush. London, 1899.

and the hypothesis may serve as a provisional guide to the interpretation of the composite nature of the fauna of the Island.

The instances quoted above by no means exhaust the list of the heterochthonous* elements in the fauna of Ceylon, but they serve to illustrate the fact that the Island has special zoogeographical relationships indicative of former geological connections, either directly or indirectly, with the Malay Peninsula and Eastern Archipelago, with the Indian Peninsula, and with Madagascar.

Turning now to a brief consideration of that portion of the fauna which is peculiar to Ceylon, the great class of the Arthropoda, comprising the Millipedes and Centipedes, Insects, Crustaceans, and Spiders, naturally furnishes the most abundant, though perhaps not the most striking evidence of endemicity. In fact, with the exception of the highest and of the lowest classes of animals (Mammalia and Infusoria respectively), all the principal divisions of the animal kingdom are represented by various percentages of endemic types.

Besides those which have been incidentally referred to above, it is well known that the Ceylon jungle fowl (*Gallus stanleyi*), which is such a familiar feature of jungle life, is a peculiar species found only in Ceylon, while the equally familiar peafowl (*Pavo cristatus*) ranges over the whole of the Indian Peninsula, being replaced in Burma, Malacca, and Java by the Burmese or Javan peafowl (*Pavo muticus*).

Of all the vertebrates of Ceylon, it is the order of Reptilia which best illustrates, within a small compass, the distinguishing characteristics of the insular fauna. Although the degree of endemicity in the fauna of Ceylon does not extend beyond the possession of peculiar genera, yet there is a group of burrowing snakes, the *Uropeltidæ* (generally known as earth-snakes), which is restricted to Ceylon and the India Peninsula, and is therefore to be noted, in a special sense, as a peculiar Indo-Ceylonese family. These snakes are called "depatnaya"† in Sinhalese, on account of the similar appearance of both extremities of the body, and of their faculty of gliding with equal facility forwards and backwards. Reverse locomotion is occasionally met with in other animals, and it always exercises a somewhat weird effect upon the imagination of the onlooker.

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* Perhaps such archaic forms as *Channa orientalis* and *Ichthyophis glutinosus* are to be regarded as truly autochthonous species which have survived fluctuations of time, climate, and topography, having inhabited the regions in which they are now found from remote periods preceding the arrival of later immigrants.

† As mentioned above, the genus *Cylindrophis* is also called "depatnaya," but it belongs to a different family, the *Ilysiidæ*.

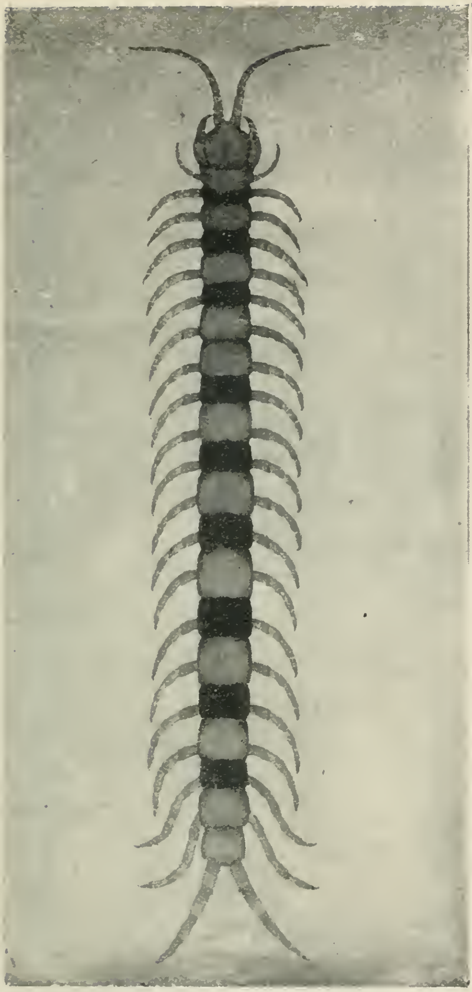

Fig. 6.—SCOLOPENDRA BICOLOR, Humbert.

A brilliant black and yellow centipede (the lighter portions are bright yellow, the head orange-coloured). Found in the sandy jungle bordering the sea from Puttalam to Trincomalee. It has a wide distribution in the East Indies.

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FIG. 7.—CERATOPHORA STODDARTII (FROM NUWARA ELIYA).

Photographed from a living specimen at the Colombo Museum.

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Some forty species of *Uropeltidæ* have been described, of which seven are known to be peculiar to Ceylon, but it is probable that more species remain to be recorded.

Three genera of lizards are peculiar to Ceylon, namely, *Ceratophora* with three species, the horned lizards of Nuwara Eliya, *Lyriocephalus*, the hump-nosed lizard of the Kandyan District, and *Chalcidoseps* a rare skink allied to *Acontias*, not represented in the Colombo Museum.

There are still two other categories of animals which play their part in the life of the island, and should therefore be mentioned before concluding this essay, namely, animals which have been introduced by human agency, and secondly, the domesticated animals.

Of the introduced animals the most important is the so-called hog-deer (*Cervus porcinus*), also known as the paddy-field deer (Wil-muwa in Siṉhalese), which is said to have been introduced by the Dutch into the Kalutara District of the Western Province, but I have not succeeded in finding any record of the date or motive of its acclimatization. It is normally an inhabitant of the Indo-Gangetic Plain, but not of the Indian Peninsula in the strict sense. Hence it is assumed by some authorities* that its presence in Ceylon is not an example of natural discontinuous distribution but of artificial introduction.

First in importance of the domesticated animals (apart from the elephant) are of course the draught-bulls which are of the three familiar kinds, the small Ceylon Bulls, the stately Brahminy Bulls which figure in procession with elephants, horses, and lions, upon the ancient moonstones of Anuradhapura, and lastly, the shaggy Indian Buffaloes, with which the wild buffaloes associate while grazing at the borders of the jungle.

The present position of Ceylon relatively to the Asiatic Continent and to the world in general has been roughly defined in the preceding lines in terms of its terrestrial fauna, and a brief reference has been made to a distribution of land and water in ancient geological times differing completely from that which we now know. On the first pages of Dr. Alcock's new and richly illustrated book† the same subject is touched upon from the marine side. After premising that the seas of India are three—to wit, the Arabian Sea, the Bay of Bengal, and the Andaman Sea—

* *E.g.*, Mr. R. Lydekker and Dr. W. T. Blanford.

† Alcock. A. A Naturalist in Indian Seas: or. Four Years with the Royal Indian Marine Survey Ship "Investigator." London (John Murray), 1902. I am indebted to the courtesy of the Hon. Mr. John Ferguson for my first acquaintance with this charming narrative.

Dr. Alcock gives expression to the opinion that these seas were formerly part of a great inland ocean, "of which the present Mediterranean is the shrunken remains. Peninsular India and Ceylon then formed a great island-continent, connected by a chain of large islands—of some of which the Maldives and Chagos and Seychelles are the tombstones—with Madagascar and South Africa, and separated from the present heart of Asia by a deep channel—a channel perhaps traversed, much as now the West Indies traverse the Caribbean, by a series of islands, which may have been lowly precursors of the Himalayas; for these gigantic mountains are of quite recent origin."

The distribution of certain deep-sea fishes and other animals can (so far as our present knowledge of the abyssal regions of the ocean extends) only be rendered intelligible by some such inference as that just quoted. A fish belonging to the family of the Weevers or Trachinidæ was first discovered in Japanese waters and named *Bembrops caudimacula* by Professor Steindachner of Vienna in 1877. Three years later it was again discovered in the Gulf of Mexico, and several years afterwards it was found by the "Investigator" to belong also to the fauna of the 100-fathom line in the Bay of Bengal, having been trawled in 128 fathoms off the Coromandel Coast.*

From a depth exceeding 700 fathoms near the Laccadives a gigantic Crustacean named *Bathynomus giganteus*, belonging to the same order (Isopoda) as the common wood-louse, was brought to the surface by the "Investigator." It was first obtained about twenty years ago at a depth of 955 fathoms in the Gulf of Mexico to the north-east of Yucatan, and was described by the late Professor A. Milne-Edwards of Paris. A specimen of this wonderful abyssal Isopod, measuring 12 inches in length and 4 inches across, has been more recently dredged off the north-east coast of Ceylon in 594 fathoms.†

Many other examples of similar distribution of marine animals which live and feed on the sea-bottom are known. Of these, one of the most notable instances is afforded by the so-called King Crabs of the genus *Limulus*, which are found living in shallow water at certain localities on the Japanese, Moluccan, Malaccan, and Indian coasts, and also off the east coast of New England and in the West Indies.

The genus *Limulus*, of which a number of fossil species dating back to the Carboniferous and Jurassic formations have been

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* Alcock, *op. cit.*, p. 120.

† Alcock, *op. cit.*, pp. 127 and 271. It is a matter for regret that the Colombo Museum does not profit by these new discoveries.

FIG. 8.—LIMULUS (FROM DUTCH BAY).

From a dried specimen in the Colombo Museum

[*To face p. 12*

unearthed, while four species are still living, is one of those animal types which are of peculiar interest to the morphologist on account of their ancient lineage (a record of which has been preserved in the sedimentary rocks), their primitive or generalized organization, and their manifold affinities.

There is an imperfect specimen of *Limulus moluccanus** in the Colombo Museum, labelled "Dutch Bay," but no further information is available, and the fishermen of Karativu know nothing about the creature.

Colombo, February 5, 1903.

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* For the most recent account of the classification and distribution of the Limulidæ, see Pocock, R. I. The taxonomy of recent species of *Limulus*. Ann. Nat. Hist. (7th series), vol. IX., pp. 256–266, pl. V.–VI., 1902. For an account of the morphology and affinities of *Limulus*, Professor E. Ray Lankester's article "Arachnida" in the first of the new volumes of the Encyclopædia Britannica (1902) should be consulted.

VARIATION OF "CATOCHRYSOPS PANDAVA,"

Horsfield.

By N. Manders, Major, R.A.M.C.

A SERIES of five males and ten females of this Lycænid Butterfly, reared by Dr. Willey, and submitted to me with the remark that they were hatched on July 4, 1902, from larvæ collected from a species of *Cycas* in the Museum grounds, show an aberration which is especially noticeable in the females, and is worthy of record as an example of non-seasonal variation.

The five males are of the ordinary rain season form, and do not vary on the upper side of the wings beyond an intensification of the dark pigment inside the posterior border in three of them, giving rise to dark lens-shaped spots, which are not conspicuous in the other two specimens.

Figs. 9 and 10. *Catochrysops pandava*, ♀, showing extremes of variation in thesubmarginal pigment spots of the hind wing.

The females are also of the rain season form, and present an interesting series showing gradual diminution of pigment in the posterior margin of the hind wing. Two of them may be regarded as typical examples of the species *C. pandava*; four of the others show a whitish suffusion of the posterior margin on the upper surface between the veins and above the black lunules, but separated from them by some blackish scales.

In the remaining four females the black lunules are entirely replaced by white, the veins however remaining black; the whitish suffusion above the lunules has become concentrated into definite white lunules, though not of so clear a white as the marginal lunules; the blackish line between the series of outer and inner lunules still persists. In all these specimens the black lunule or ocellus external to the tail-like appendage of the

hind wing persists as a much reduced black spot almost circular, crowned internally with a few orange scales; in two individuals a few black scales represent the lunules internal to the tail.

On the under surface in both sexes the changes, as regards the presence or absence of the marginal spots, are the same, except that the ocellus and anal spots persist more conspicuously.*

Colombo, December 17, 1902.

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* For an account of the seasonal variations of *Catochrysops pandava* see Marshall and De Nicéville, "The Butterflies of India, Burma, and Ceylon," Vol. III., Calcutta, 1890, p. 183, pl. XXVII., figs. 187 and 188.

"NYCTALEMON PATROCLUS" IN KANDY.

By F. M. Mackwood.

NYCTALEMON PATROCLUS is a moth of large size belonging to the family Uraniidæ. The colour of the wings is a varying shade of smoky brown or sepia, speckled with black and with a straight whitish band across the middle.

The species has been recorded from China, Sylhet, Burma, Andamans, Malacca, Philippines, and Papuan sub-region.*

Last December (1902) a specimen was caught in Lady Horton's walk, Kandy, this being its first record for Ceylon. Since then another example has been caught on the bank of the river near Kandy, and was purchased by a tourist.

The span of the wings (*i.e.*, from tip to tip of the fore wings) is $5\frac{1}{4}$ inches, and the distance from the tip of the fore wing to the tail of the hind wing is also $5\frac{1}{4}$ inches in the expanded condition.

[It is somewhat remarkable that such a large species should have escaped notice for so long, especially when we take into consideration the number of collectors who have worked in the Kandy District. Fresh records of its occurrence will be awaited with interest, and it must be left to the future to decide whether it is an accidental immigrant or a normal incoline.—Ed.]

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* Sir G. F. Hampson, "Fauna of British India: Moths," Vol. III., 1895, pp. 111-112, fig. 57.

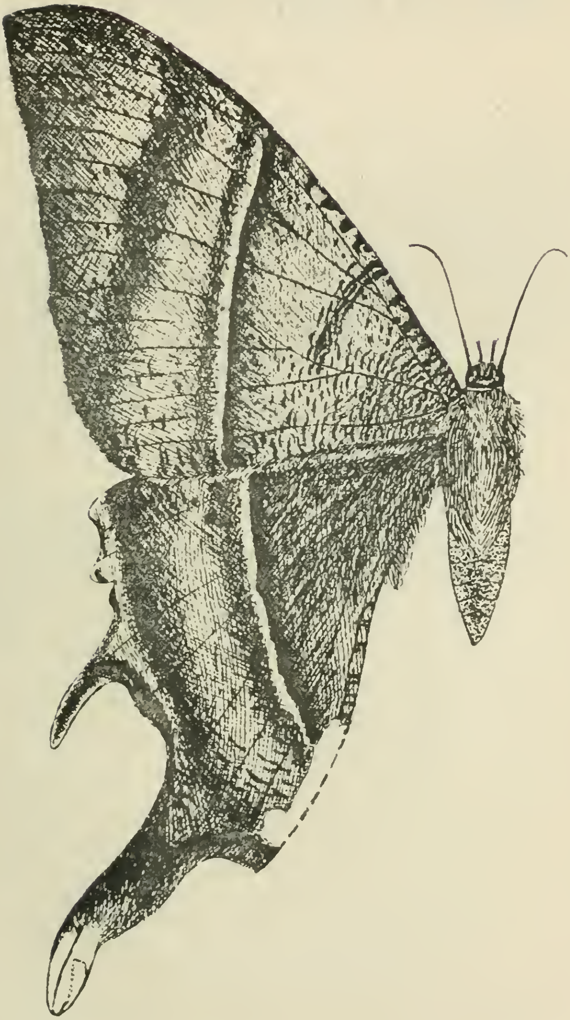

Fig. 11. *Nyctalemon patroclus*, Linn.. ♂ (Colln. F. M. Mackwood).

Drawn from the original specimen lent to the Colombo Museum. Natural size.

NOTE "ON MYCALESIS SUBDITA," *Moore.*

By N. MANDERS, Major, R.A.M.C.

THIS species was originally described by Moore* from specimens collected at Udugama near Galle by Mr. John Pole. A pair is now in the Museum collection. So far as I know, very few specimens have been taken, but it probably only requires to be looked for at almost any time of the year in its particular haunts amongst bamboos, on which the larva probably feeds. With such few specimens to judge from, it is perhaps not quite certain that it is a good species, but to my mind it looks distinct enough.

In looking over Mr. Mackwood's collection of South Indian butterflies I was greatly interested to notice two specimens of this insect, which agree exactly with the types in the Museum; the insect therefore is of wider distribution than has been hitherto supposed; the specimens are unfortunately without labels, and the locality of capture is doubtful.

Colombo, December 17, 1902.

* Described in Moore's great iconographic work "Lepidoptera Indica," now being issued in parts. It is also described briefly by L. de Nicéville and Major Manders in their joint work, entitled "A List of the Butterflies of Ceylon, with Notes on the Various Species," in Journ. Asiat. Soc., Bengal. Vol. LXVIII., Part II., 1899, p. 181.

THE MAHSEER AND THE MURREL IN CEYLON.

By A. WILLEY.

THE Mahseer is probably the most admired game fish of India, and, in the opinion of experts, shows more sport than the salmon; not that it sustains so long a contest, but makes a more impetuous rush.* It is known to occur in the perennial rivers of the Bengal, Madras, and Bombay Presidencies, but anglers are not altogether satisfied that it occurs in Ceylon, although ichthyologists are aware that it does (*cf.* Day, "Fishes of India," p. 307).

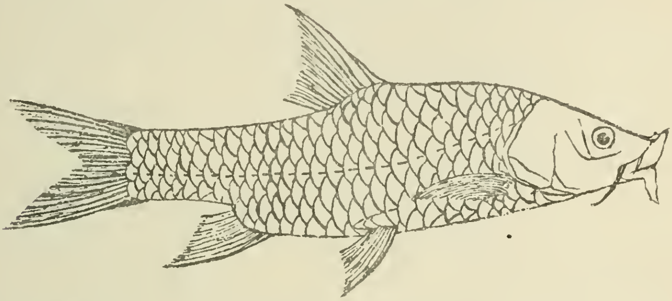

Fig. 12. *Barbus tor.* Sketch based upon a figure in Day's "Fishes of India."

The fact is that the mahseer is an exceedingly variable kind of barbel, exhibiting both local and individual variations, and different specimens may appear, at first sight, to be utterly distinct, owing to the circumstance that certain individuals possess a curious bilabiate growth proceeding from the upper and lower lips, while others, for some unaccountable reason, have no such lobes.† Whether or not this is a sexual character or a seasonal variation or a mere sport, I am unable to say. The specimen which I have examined, caught by Mr. C. A. Hartley in the Sítala-gaṇga, in which the processes were well developed, was a young male.

* Thomas, H. S., "The Rod in India." Mangalore, 1873. I am indebted to this book for details concerning the habits of the Mahseer. I also take this opportunity of acknowledging with thanks the receipt of specimens of the Ceylon mahseer from Mr. C. A. Hartley of Maskeliya and from Mr. A. C. W. Clarke of Pundalu-oya.

† The bilabiate form of the mahseer bears a striking resemblance to a fish recently described by Mr. G. A. Boulenger from the Kenya District in East Africa, under the name *Barbus labiatus.* n. sp. (P. Zool. Soc., London. 1902. p. 223. pl. XVII., fig. 1.)

The Ceylon mahseer (*Barbus tor*)* is co-specific with the Indian mahseer, though, perhaps, if a sufficient number of specimens were measured, weighed, and compared, it would be found to constitute an insular race of the species.

With regard to dimensions, Mr. Thomas notes an interesting correlation between the size of the Indian mahseer and that of the rivers which these fishes frequent, unfortunately without tabulating his observations nor even naming the rivers. "In some rivers," he says, "they do not run above 10 or 12 lb., whereas in others they have been taken weighing 40 lb. and 50 lb., and even as much as 74 lb."†

It is instructive to learn that the size, or what comes to the same thing, the importance of the fish caught, does not bear any sort of relation to the size of the bait used to tempt him, very small fishes being often captured upon very large spoons and *vice versâ*.

The mahseer is essentially a ground-feeding fish, preferring a diet of crabs, molluscs, and small fish. Like all members of the Carp family (*Cyprinidæ*), to which it belongs, its jaws are toothless and it kills its victims by compression, afterwards crunching them to fragments by means of teeth which are set far back in the throat, borne upon the inferior pharyngeal bones; these are the pharyngeal or throat-teeth. The mahseer will also devour seeds which fall into the water, or rice which may be thrown in, as well as aquatic weeds and insects. Finally it is, to a limited extent, a surface-feeder, and will take the fly. The barbels or feelers, four in number,‡ which fringe the mouth, are organs which are specially characteristic of bottom-feeding fishes, such as the barbels and catfishes (*Siluridæ*). The fleshy lips of the mahseer are well adapted to exert a powerful suctorial action upon rocks and stones, by which it is enabled to detach the molluscs which adhere to them.

According to Mr. Thomas's observations, the mahseer travels long distances up stream during the monsoon rains for the purpose of depositing its spawn in the more or less protected headwaters of the rivers. It does not spawn all at once, as the salmon does, but lays its eggs in batches, repeating the process several times in a season. This, it should be added, is inferred from examination of the ovaries, and is not the result of direct

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* Synonymous with *Barbus mosal*. The Siŋhalese name is Léla.

† Mr. C. A. Hartley informed me last June (1902) that he had never taken one weighing above 2 or 3 lb. from the Sítala-gaŋga, but that probably larger individuals would be met with in the main Maskeliya river into which the Sítala-gaŋga flows. The largest specimen received at the Museum measured somewhat less than a foot in length.

‡ A rostral pair and a longer maxillary pair.

observation. The result of this graduated oviposition is that the mahseer, unlike the spent salmon, never becomes so emaciated as to be unfit for human food.

It may be useful to sportsmen and naturalists living in out-stations to explain the manner in which the mahseer in particular, and freshwater fishes in general, may be identified.

The mahseer may be recognized in the open by its fighting qualities, and in the laboratory or museum by the arrangement of its scales. Down each side of the body from the gill region to the tail fin there is one row of scales, which exhibits a series of minute perforations. These are the orifices of small tubular sensory organs composing the so-called lateral line apparatus, which is innervated by a special branch of the tenth cranial nerve known as the lateral line nerve.

The number of scales in the lateral line is an important diagnostic feature in the determination of any species of fish, taken, naturally, in conjunction with its other characters, *e.g.*, presence or absence of teeth, presence or absence of barbels, number of fin-rays in the fins, especially in the dorsal and anal fins. The mahseer has no jaw teeth ; it has two pairs of barbels, twelve rays in the dorsal fin, of which the first three are osseous (the first very small), seven or eight rays in the anal fin, of which the first two or three are osseous, and twenty-four or twenty-five scales in the lateral line.* The tail fin is forked. In the middle line of the back there are nine scales in front of the dorsal fin. The body is elongated, the height being equal to about one-fourth of the length excluding the caudal fin.

Just as the mahseer, from an angling point of view, takes the place, in India and Ceylon, of the salmon of the West, so the murrel may be regarded as representing the pike in the economy of the inland waters, although all these fishes belong to totally distinct families.

The murrel or lúlá (*Ophiocephalus striatus*) is a large, nearly black, somewhat flat-headed fish, with long, many-rayed dorsal and anal fins and rounded tail fin (see fig. 2 facing p. 5). The dorsal and anal fins end abruptly behind and are not continuous with the tail fin. The lateral line does not extend in a straight line from the gill region of the head to the tail, but is bent downwards over two rows of scales at the level of the twelfth dorsal fin-ray, and is thence continued to the base of the tail fin. The Indian murrel attains a length of 2 to 3 feet. The Colombo Museum has a specimen of the Ceylon murrel with total length of

* In the case of the Indian Mahseer the number of scales in the lateral line is twenty-five to twenty-seven according to Günther and Day.

2 feet 3 inches and maximum breadth across the head of 4 inches; height of body behind pectoral fins $3\frac{1}{2}$ inches (without reckoning the dorsal fin); weight (after removal of gut) nearly 4 lb.

The Ophiocephalidæ are commonly known as walking fishes on account of the fact that they are able to exist for lengthened periods out of water and can travel in a serpentine manner overland. Day* witnessed the exhumation of some *Ophiocephali* from the mud of a dried-up tank. They are capable of an amphibious mode of respiration in virtue of the existence of air cavities in the head (accessory to the true gill cavities), which impart a more or less labyrinthine structure to the pharyngeal bones though not so complicated as the elaborate suprabranchial apparatus of the Climbing Perch (*Anabas scandens*), the "Kávaiya" of the Sinhalese.

The climbing and burrowing fishes of Ceylon were treated at considerable length by Sir E. Tennent, who reminded his readers that these phenomena were known to the ancients. "It is an illustration," he says on p. 344 of his work on the Natural History of Ceylon, "of the eagerness with which, after the expedition of Alexander the Great, particulars connected with the natural history of India were sought for and arranged by the Greeks, that in the works both of Aristotle [De Respiratione] and Theophrastus [De Piscibus in sicco degentibus] facts are recorded of the fishes in the Indian rivers migrating in search of water, of their burying themselves in the mud on its failure, of their being dug out thence alive during the dry season, and of their spontaneous re-appearance on the return of the rains."

Last year I picked up a "Kávaiya" which was toiling along the wayside in the Southern Province, and on arrival at the next resthouse placed it in a basin of water for the night. At daybreak the fish was found healthy and active on the floor, while the basin was tenanted by a drowned rat.

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* Day, F., "Fauna Brit. Ind.: Fishes," Vol. II., p. 359.

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